

## **WHITE PAPER**

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# **Pausing for Learning: Adapting the Army After Action Review Process to the NASA Project World**

**Developed at the  
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**by  
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## Summary

This paper introduces a concept for formalizing learning from NASA projects that is modeled after the Army After Action Review (AAR) system. While the AAR was developed to learn from training exercises, the 25 years of experience, theoretical foundations and practical tools make it a valuable source of lessons for NASA. In addition, NASA continues to ignore the lessons from successes and overly focuses on learning only from mistakes. Without a process for learning from every activity regardless of ultimate outcome, we risk missing out on the bulk of the learning from our projects and potentially not really knowing why we actually succeeded.

This new process is called “Pausing for Learning” or PFL. The idea is to create a learning event at the end of selected critical events in the life of a project. End of project reflections are good but are too infrequent for the organization to learn in a timely manner. Also much intermediate learning is lost between concept and launch. PFLs are integrated into the project life cycle at key points as natural parts of the process. Being facilitated and assembled by outsiders, the key project team members are only required to do a small marginal amount of additional effort. This means that PFLs have the potential to deliver a very high value for the small investment of time and money.

## The Learning Organization

A learning organization knows how to process knowledge, appreciates the value of shared collective knowledge and grows stronger and more knowledgeable with each activity performed. In order to meet the challenges, take advantage of the opportunities and to best utilize our available resources, NASA needs to make a strong commitment to becoming the best learning organization it can be.

The United States will develop the innovative technologies, knowledge and infrastructures both to explore and support decisions about the destinations for human exploration.

President George W. Bush, **Vision for U.S. Space Exploration: A Renewed Spirit of Discovery**, delivered on January 14, 2004

We are in a race with our own human capacities to learn, share and apply what we can conceive, build and validate.

Knowledge is central to our new vision. Functioning more like a learning organization that takes advantage of the knowledge we have will be central to our success. We are no longer in a race with other nations. We are in a race with our own human capacities to

learn, share and apply what we can conceive, build and validate. As the CAIB pointed out, NASA has as many managerial limiting factors as it does technological constraints. Alan MacCormack (2004) of the Harvard Business School recently pointed out that NASA failed to learn from the Faster Better Cheaper (FBC) era because it conducted post-mortems *only on failed projects*. Thus NASA did not know what worked and what didn't.



## **The Challenge to Change**

The Need for a Plan to Manage Knowledge and Build a Learning Organization at NASA has been highlighted in a number of official documents. Much of the post-Columbia discussion of change has been about the need to change the culture at NASA. The Agency is in the middle of a culture change initiative aimed at unlearning some old behaviors and adopting new ones. Old systems, once reliable enough are not so today. Faster, Better, Cheaper removed slack in the system as did budget cuts, privatization, competition for commercial space flight and shifting Federal budget priorities. The lack of a clear vision at NASA post-Apollo has also been cited as a reason the Agency has slid into operational stances it now finds under scrutiny in the CAIB Report. A common thread in these discussion is the management culture at NASA is too resistant to change. Consider this blunt statement in the CAIB Report:

*Based on NASA's history of ignoring external recommendations, or making improvements that atrophy with time, the Board has no confidence that the Space Shuttle can be safely operated for more than a few years based solely on renewed post-accident vigilance.*

CAIB Report p13.

The new Exploration Enterprise (EE) is a direct result of these concerns. It is thus paramount that the EE not only address the exploration challenge of the new vision but also address the learning deficiencies pointed out in these reports. PFLs will help achieve both. A few other quotes to capture the broad mandate to change the way we do business.

## **The President's Management Agenda**

*The Administration will adopt information technology systems to capture some of the knowledge and skills of retiring employees. Knowledge management systems are just one part of an effective strategy that will help generate, capture, and disseminate knowledge and information that is relevant to the organization's mission.*

## **NASA Integrated Action Team Report, Dec. 2000**

*Although NASA's efforts so far are commendable, the Agency must go further. In the current environment, effective management and sharing of knowledge is more critical than ever. **The experience of prior managers is not uniformly well documented and made available for the benefit of newer or less experienced program and project managers to effectively utilize in their situations.***

## **US General Accounting Office GAO-02-195, 2002**

*NASA needs to strengthen its lesson learning in the context of its overall efforts to develop and implement an effective knowledge management program. We recommend that the NASA administrator strengthen the agency's lessons learning process and systems by: **articulating the relationship between lessons learning and knowledge management through an implementation plan for knowledge management**; designating a lessons learned manager to lead and coordinate all agency lessons learning efforts; developing ways to broaden and implement mentoring and 'storytelling' as additional mechanisms for lessons learning; enhance the Lessons Learned Information System; and*

*track and report on the effectiveness of the agency's lessons learning efforts using objective performance metrics.*

### **Columbia Accident Investigation Board (CAIB) Report Aug. 2003**

*The Board concludes that NASA's current organization does not provide effective checks and balances, does not have an independent safety program, and **has not demonstrated the characteristics of a learning organization.** (p 12)*

*Shuttle management declined to have the crew inspect the Orbiter for damage, declined to request on-orbit imaging, and ultimately discounted the possibility of a burn-through. The Board views the failure to do so as an illustration of the lack of institutional memory in the Space Shuttle Program that supports the Board's claim... **that NASA is not functioning as a learning organization.** (p. 127)*

### **Renewed Commitment to Excellence (Diaz Report) Jan 2004**

*NASA personnel need to achieve a high level of technical and managerial competency along with a high state of readiness to deal with the research, developmental and operational challenges inherent in the aerospace systems they manage and operate. In concert, **the technical tools, information systems, and knowledge repositories of the Agency must be up to date and readily available to be used by personnel across the Agency.** (p. 11)*

*The Agency should identify an appropriate approach for the future development of a knowledge management system and infrastructure to assure knowledge retention and lessons learned. (p. 11)*

### **Office of Personnel Management: Expected Outcomes from KM**

*Organizations have an effective strategic knowledge management (KM) effort in place. Technology is used to support the knowledge management effort. Innovative and collaboration occur throughout and across the organization. (OPM Statement)*

### **Lessons from Goddard's Response to the Challenge**

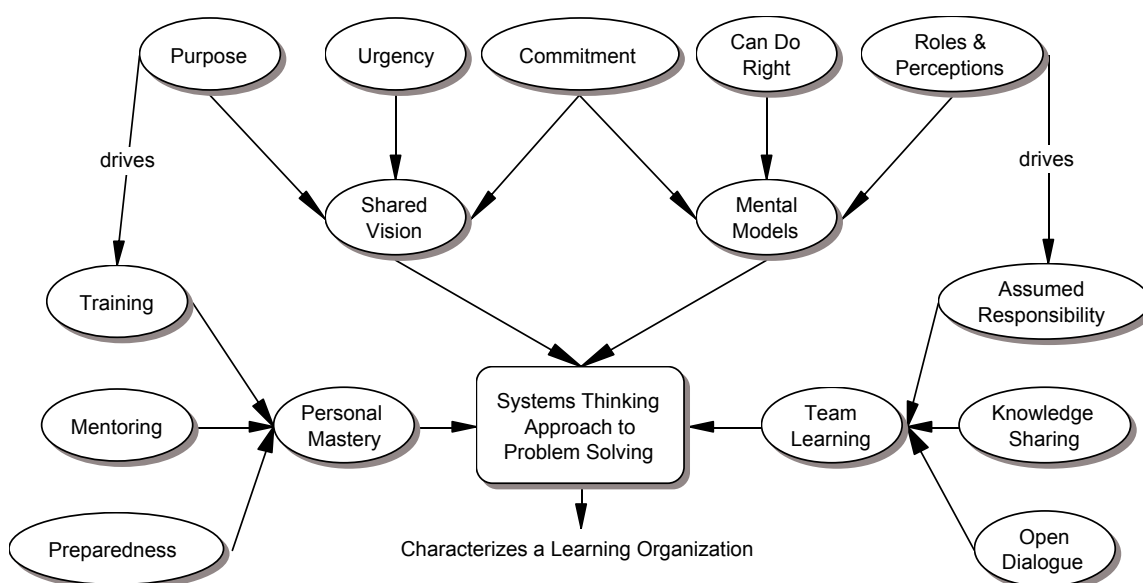
NASA must become a learning organization that by nature learns, evolves, creates and applies knowledge effectively and efficiently. PFLs are a way to take us to the new organizational structure, culture and processes that will enable Goddard to continue to fulfill our unique mission for the American Public, NASA, and the scientific world who have placed their trust in us to explore the frontier of space.

The Goddard Plan is designed to overcome the previous Agency focus on IT as a KM driver with its over-emphasis on ***capturing knowledge from workers*** for the organization and instead focuses on ***facilitating knowledge sharing among workers.***

A learning organization is able to adapt and change and thereby address the challenges in its path towards the successful attainment of goals. Peter Senge laid out the need for an organization to be excellent at Personal Mastery, Mental Models, Shared Vision, and Team Learning. But having these wasn't enough. To learn and adapt as an organization there had to be a Systems Thinking Capability throughout the organization in addition to these four foundational disciplines. He called this thinking the 'Fifth Discipline'.<sup>1</sup>

Senge's model links the need for shared vision, mental models geared toward learning, personal mastery of required skills and team learning in order to truly achieve the level of systems thinking required to develop a learning organization. Clearly communication, culture (openness) and structure are also integral to building a learning organization. While the Senge model below calls for developing all four foundations of a learning organization the Diaz team's NASA-wide actions resulting from the CAIB R-O-Fs require that NASA start by addressing training and learning technology on a comprehensive basis (R6.3.1) and addressing the management of agency knowledge more systematically for rapid and effective reapplication (F7.4-9)<sup>2</sup>.

FIGURE 1: THE SENGE LEARNING ORGANIZATION MODEL



The CAIB Report also specifically calls out to NASA the fact that the organization is 'not functioning as a learning organization.' Goddard needs to function as fully as possible as a learning organization. Future NASA projects should never accept risk or experience failure because the organization did not apply its best own knowledge.

**Future NASA projects should never accept risk or experience failure because the organization did not apply its best own knowledge.**

<sup>1</sup> Senge, Peter. (1990). *The Fifth Discipline*.

<sup>2</sup> The R (recommendation) and F (finding) refer to the Diaz Report matrix.

## ***Lessons from 25 Years of Army After Action Reviews***

An AAR is "...a professional discussion of an event, focused on performance standards, that enables *soldiers to discover for themselves* what happened, why it happened, and how to sustain strengths and improve on weaknesses" [italics added]

A Leader's Guide to After-Action Reviews, 1993 p 1.

The Army learned from years of experience with AAR that much of the value in the AAR exercise comes from several key design parameters. First, the focus of the AAR is specific to 1) What happened (events), 2) Why did it happen (cause), 3) How can we improve (action). Second, the AAR is a participant discussion. AAR's replaced traditional top down lecture critiques. What was valuable about AAR's was the voice of the team members themselves offering up their views and ideas. Third, the AAR is close to the action in time, space and personnel. Fourth, the AAR does not function as a career review. It is a non-attribution team review of what happened. The team members participate because they feel free to speak. Finally, the AAR is part of the overall process whether it be a training exercise, a simulation or a field operation. The action is not complete until the AAR has been conducted. The AAR is a fundamental part of the process built into the project. The AAR method replaced sterile lecture type critiques delivered by judges often some time after the end of the events. The participants were not energized and sometimes defensive about these reviews. While many teams and groups at NASA meet and discuss events after they happen, NASA has no formal process to guide the meaningful collection of learnings in the way AAR's function.

## ***Pausing for Learning at NASA: The Proposed Process***

The PFL can be described as a 3-step process outlined below. Key is having knowledgeable facilitators that are familiar with the topic, the people and process.

### Step 1

- Identify when PFLs will occur
- Determine who will attend PFLs
- Select Moderators, Rapporteurs
- Select potential PFL sites
- Review the PFL plan

### Step 2

- Review what was supposed to happen
- Establish what happened (esp. dissenting points of view)
- Determine what was right or wrong with what happened
- Determine how the task should be done differently next time

### Step 3

- Review objectives, tasks, and common procedures
- Identify key events
- Rapporteurs collect *ALL* observations
- Organize observations (identify key discussion or teaching points)

## ***Conducting a PFL: Roles and Responsibilities***

One of the key designs of the PFL is minimal intrusion into project work time. To maintain this, the roles of the participants and the supporting staff who conducts the PFL are clearly laid out here. The facilitator does not need to be an outsider. NASA should consider the PFL facilitator a role to aspire to in project management.

### **PFL Project Attendees**

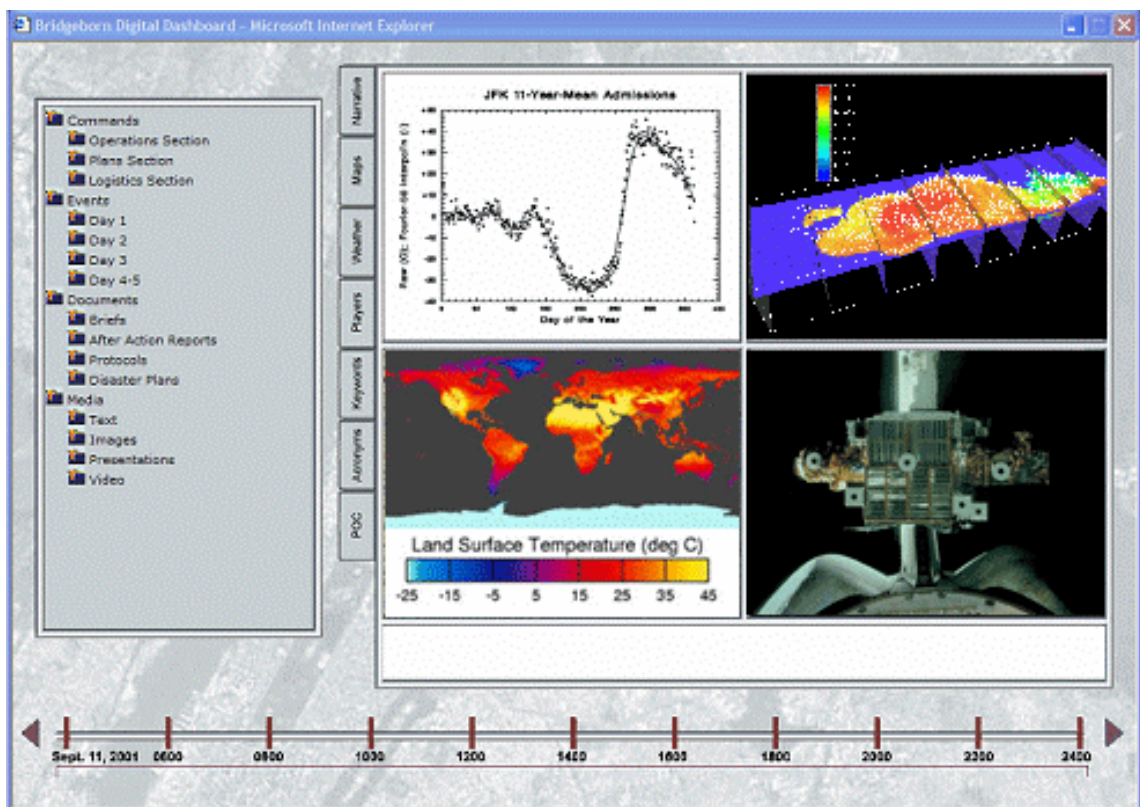
Show up to the event  
 You may be asked to bring notes or supporting documentation,  
 Listen to moderator summaries  
 Be responsive and open to different ideas  
 You will be asked to re-state portions of an activity  
 Do not take this as a lecture or critique  
 Relate what happened from your own POV  
 Explore alternative courses of action  
 Handle discovery of errors positively  
 Leaders should discuss the events with their people in private  
Follow-up on needed actions

### **PFL Supporting Staff**

Gather attendees: some projects already hold debrief or talk down sessions  
 Moderator reviews events  
 Summarize key events  
 Encourage participation  
 Have junior leaders re-state portions of their part of an activity  
 Do not lecture or critique  
 Ask why certain actions were taken  
 Ask how they reacted to situations  
 Ask when actions were initiated  
 Exchange “war stories”  
 Relate events to subsequent result  
 Explore alternative courses of action  
 Handle discovery of errors positively  
 Summarize  
Follow-up on needed actions

After the PFL session is held, the information collected is organized into a visual digital interface for representation over the web. The material is kept in its raw form at the unit level but the PFL contents are easily searchable by the team members for use in learning, extracting important lessons to share up the line and for future planning sessions. From work done with the U.S. Navy, here is a notional picture of what the graphical user interface (GUI) might look like.

FIGURE 2: NOTIONAL PFL GRAPHICAL USER INTERFACE



### Key Attributes of GUI for a PFL

- Project Timeline
- Document Tree
- Project Charts
- Video Interface
- Standard Content Tabs (structure)
- Easy Navigation
- Interactive Learning
- Exploratory Nature
- Searchable Database

Goddard Space Flight Center is in the process of beginning a pilot for the PFL process as a part of the Center's response to the CAIB and DIAZ reports. While Goddard moves ahead with this pilot, NASA has the opportunity to embed a PFL concept in its projects and programs now to avoid the mistake of not capturing the project lessons as they unfold over the next decades. In fifteen or twenty years when we actually launch a human voyage to Mars, it will be because we have successfully applied all that we learned from our build up missions to the Moon and robotic trips to Mars.



## ***Applicability to Building the NASA Learning Organization***

The pilot PFL project at Goddard will enable NASA, other centers and partners to learn how and when to insert the PFL concept into the project management process.

The PFL concept is not new. It is based on many years of experience, organizational and behavioral research and practical insertion into project life cycles. NASA has been criticized for not taking learning seriously enough in its organizational systems. Adopting a PFL type of concept will not only build learning into the programs and projects undertaken but also help lead the change the Agency is trying accomplish towards becoming the best learning organization it can be.

NASA has embarked on a Lessons Learned initiative to extract lessons from across the agency. While it is good to catch up on knowledge that is lying around, extraction methods are not a sustaining design for a learning organization. Fundamentally, learning activities must be useful to the participants and not just future users of the information. This is a critical design flaw copied over and over in corporate and government lessons learned processes. PFLs like AARs are designed to benefit the participant as much as future users. This is what makes the PFL an effective tool for establishing the learning culture that NASA needs now. When coupled with effective lessons learned, technical standards and safety reporting systems, PFLs can play a critical role in effective learning.

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